What is the role of IVUS in peripheral arterial endovascular procedures

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Intravascular Ultrasound Imaging–Guided Versus Coronary Angiography–Guided Percutaneous Coronary Intervention: A Systematic Review and Meta-Analysis

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IVUS–guided PCI was associated with lower cardiovascular death, MI, TLR, and ST, compared with coronary angiography alone

Study or Subgroup	IVUS Events	IVUS Total	Angio Events	Angio Total	Weight	Risk Ratio M-H, Random, 95% CI
AIR-CTO 2015	5	115	9	115	1.8%	0.56 [0.19, 1.61]
AVID 2009	39	395	45	406	7.6%	0.89 [0.59, 1.34]
CHEN et al 2012	11	123	13	123	3.2%	0.85 [0.39, 1.81]
Choi et al	86	1674	275	4231	12.0%	0.81 [0.64, 1.02]
CTO-IVUS 2015	5	201	10	201	1.8%	0.50 [0.17, 1.44]
De la Torre Hernandez 2014	39	505	32	505	6.7%	1.22 [0.78, 1.91]
DIPOL 2007	3	83	6	80	1.2%	0.48 [0.12, 1.86]
EXELLENT 2013	9	463	8	463	2.2%	1.13 [0.44, 2.89]
Gao et al 2014	8	291	24	291	3.0%	0.33 [0.15, 0.73]
HOME DES IVUS 2010	6	105	6	105	1.7%	1.00 [0.33, 3.00]
Hong et al 2014	17	201	17	201	4.2%	1.00 [0.53, 1.90]
IVUS-XPL 2015	17	700	33	700	4.9%	0.52 [0.29, 0.92]
Kim et al 2013	12	269	18	274	3.6%	0.68 [0.33, 1.38]
MATRIX 2011	60	548	66	548	9.4%	0.91 [0.65, 1.26]
OPTICUS 2001	31	273	30	275	6.4%	1.04 [0.65, 1.67]
Roy et al 2008	61	884	43	884	8.2%	1.42 [0.97, 2.07]
Ultimate 2018	20	724	37	724	5.4%	0.54 [0.32, 0.92]
Wakabayashi et al 2012	34	637	45	637	7.1%	0.76 [0.49, 1.16]
Witzenbichler et al 2014	51	3349	124	5234	9.6%	0.64 [0.47, 0.89]
Total (95% CI)		**11540**		**16097**	**100.0%**	**0.81 [0.70, 0.94]**
Total events	514		841			

Heterogeneity: Tau² = 0.03; Chi² = 27.95, df = 18 (P = 0.06); I² = 36%
Test for overall effect: Z = 2.71 (P = 0.007)

Risk Ratio M-H, Random, 95% CI
0.01 0.1 1 10 100
IVUS Angio

Figure 4. Forest plots for major adverse cardiovascular events. Risk ratio of target lesion revascularization associated with intravascular ultrasound (IVUS)–guided compared with angiography (Angio)–guided percutaneous coronary intervention. AIR-

The mid-term effect of intravascular ultrasound on endovascular interventions for lower extremity peripheral arterial disease: A systematic review and meta-analysis

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B

Study or Subgroup	IVUS Events	IVUS Total	Angiography Events	Angiography Total	Weight	Risk Ratio M-H, Random, 95% CI	Year
Buckley 2002	0	49	5	22	0.8%	0.04 [0.00, 0.72]	2002
Baker 2015	2	20	1	20	1.2%	2.00 [0.20, 20.33]	2015
Krishnan 2018	8	46	35	68	9.8%	0.34 [0.17, 0.66]	2018
Fujihara 2020	14	33	10	33	10.2%	1.40 [0.73, 2.69]	2020
Tsubakimoto 2021	4	34	14	37	5.4%	0.31 [0.11, 0.85]	2021
Tsujimura 2021	13	540	2	138	2.8%	1.66 [0.38, 7.27]	2021
Tsujimura 2022	12	76	13	74	9.0%	0.90 [0.44, 1.84]	2022
Allan 2022	13	244	21	244	9.9%	0.62 [0.32, 1.21]	2022
Setogawa 2023	9431	31534	8395	31534	26.9%	1.12 [1.10, 1.15]	2023
Smith 2023	218	3424	220	3424	23.9%	0.99 [0.83, 1.19]	2023
Total (95% CI)		**36000**		**35594**	**100.0%**	**0.85 [0.65, 1.10]**	
Total events	9715		8716				

Heterogeneity: Tau² = 0.07; Chi² = 29.72, df = 9 (P = 0.0005); I² = 70%
Test for overall effect: Z = 1.24 (P = 0.21)

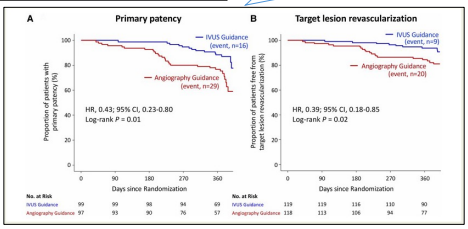
Risk Ratio M-H, Random, 95% CI
0.01 0.1 1 10 100
Favors IVUS Favors Angiography

Fig: f-TLR at 12 months

Intravascular ultrasound-guided drug-coated balloon angioplasty for femoropopliteal artery disease: a clinical trial

Young-Guk Ko,[1,2] Seung-Jun Lee,[1] Chul-Min Ahn,[1] Sang-Hyup Lee,[1] Yong-Joon Lee,[1] Byeong-Keuk Kim,[1] Myeong-Ki Hong,[1] Yangsoo Jang,[1] Tae-Hoon Kim,[1,3] Ha-Wook Park,[1] Ji Yong Jang,[4] Jae-Hwan Lee,[1,4] Jae-Hyeong Park,[5] Su Hong Kim,[1] Eui Im,[6] Sang-ho Park,[6] and Donghoon Choi[1]; on behalf of the IVUS-DCB investigators

IVUS better primary patency (86.6% vs. 74.6%) and freedom from clinically-driven target lesion revascularisation (92.4% vs. 83.0%)



➢ ***Aim:***

To conduct a systematic review and meta-analysis of all studies that compared clinical outcomes of peripheral percutaneous transluminal angioplasty (PTA) procedures using angiography only (AO-PTA) vs using angiography and IVUS (IVUS-PTA) in PAD.

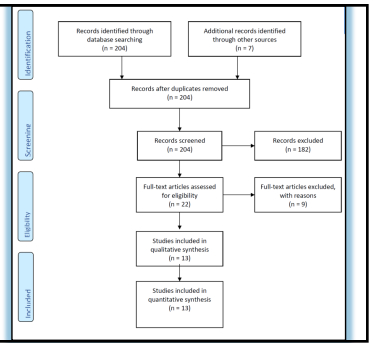
➢ ***Primary Outcome:***

Freedom from Targeted lesion Revascularisation (f-TLR) at 12 months

➢ ***Secondary Outcomes:***

- Technical success
- Need for bail-out stenting
- Freedom from Major Amputation (f-MA) at 12 months

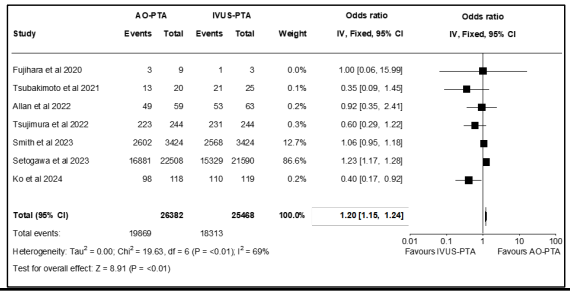
Methodology:



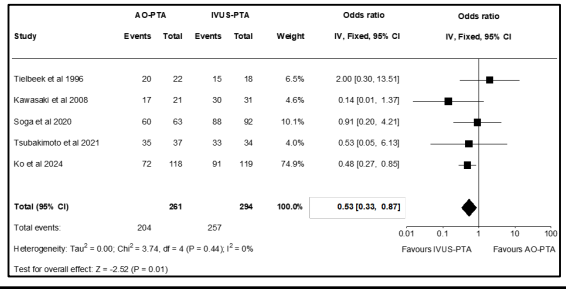
No.	Study	Date	Design	Pro vs Retro	Patients	Gender	No. of Patients/lesions treated		Propensity matching (pairs)	Revascularization Strategy							
						Male				Balloon		Adjunctive Open		Atherectomy		Adjunctive Thrombolysis	
							IVUS-PTA	AO-PTA		IVUS-PTA	AO-PTA	IVUS-PTA	AO-PTA	IVUS-PTA	AO-PTA	IVUS-PTA	AO-PTA
1	Ko et al	2024	RCT	Pro	237	202	119	118		119	118	24	17	41	38	NA	NA
2	Setogawa et al	2023	Cohort	Retro	85,649	62,449	50,925	34,724	31,534	6,408	3,710	799	1546	NA	NA	NA	NA
3	Smith et al	2023	Cohort	Retro	65,038	38,757	61,614	3,424	3,424	NA	NA	0	0	2,096	1,405	0	0
4	Tsujimura at al	2022	Cohort	Pro	1,091	758	843	248	244	244	244	NA	NA	NA	NA	NA	NA
5	Allan et al	2022	RCT	Pro	150	96	76	74	-	52	51	NA	NA	24	19	NA	NA
6	Tsubakimoto et al	2021	Cohort	Retro	64	52	34 lesions	37 lesions	-	5	1	NA	NA	NA	NA	NA	NA
7	Fujihara et al	2020	Cohort	Retro	216	167	58	158	33	NA	NA	NA	NA	NA	NA	NA	NA
8	Soga et al	2020	Cohort	Retro	155	108	92	63	-	NA	NA	NA	NA	NA	NA	NA	NA
9	Panaich et al	2016	Cohort	Retro	92,714	50,807	1,299	91,415	-	1,296	91,141	416	39,308	NA	NA	145	77,703
10	Iida et al	2014	Cohort	Retro	965	695	268 limbs	930 limbs	234	NA	NA	NA	NA	NA	NA	NA	NA
11	Kawasaki et al	2008	Cohort	Retro	47	40	27 (31 lesions)	20 (21 lesions)	-	NA	NA	NA	NA	NA	NA	NA	NA
12	Buckley et al	2002	Cohort	Retro	52	NA	36 (49 limbs)	16 (22 limbs)	-	NA	NA	11	5	NA	NA	NA	NA
13	Tielbeek et al	1996	Cohort	Pro	40	30	18	22	-	NA	NA	NA	NA	NA	NA	NA	NA

Results

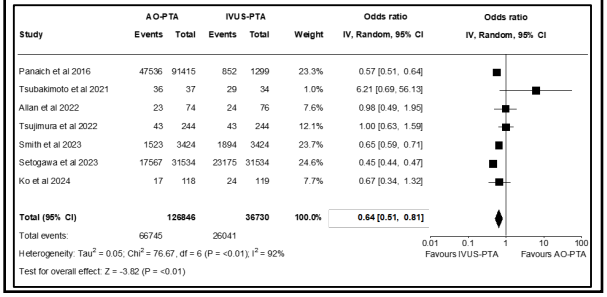
F-TLR at 12 months



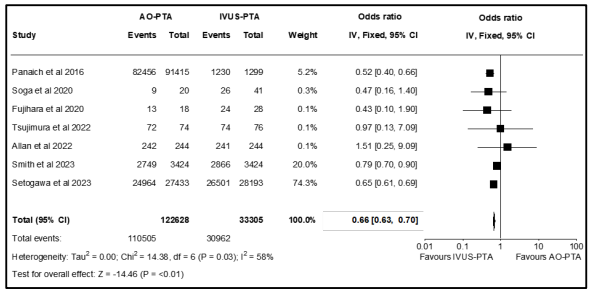
Technical success rate



Need for bail-out stenting



F-MA at 12 months



Study	AO-PTA Events	AO-PTA Total	IVUS-PTA Events	IVUS-PTA Total	Weight	Odds ratio IV, Fixed, 95% CI
Panaich et al 2016	82456	91415	1230	1299	5.2%	0.52 [0.40, 0.66]
Soga et al 2020	9	20	26	41	0.3%	0.47 [0.16, 1.40]
Fujihara et al 2020	13	18	24	28	0.1%	0.43 [0.10, 1.90]
Tsujimura et al 2022	72	74	74	76	0.1%	0.97 [0.13, 7.09]
Allan et al 2022	242	244	241	244	0.1%	1.51 [0.25, 9.09]
Smith et al 2023	2749	3424	2866	3424	20.0%	0.79 [0.70, 0.90]
Setogawa et al 2023	24964	27433	26501	28193	74.3%	0.65 [0.61, 0.69]
Total (95% CI)		**122628**		**33305**	**100.0%**	**0.66 [0.63, 0.70]**
Total events:	110505		30962			

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 14.38$, df = 6 (P = 0.03); $I^2 = 58\%$

Test for overall effect: Z = -14.46 (P = <0.01)

Limitations

- **Anatomical location of the treated lesions:**
  - **1 Study in iliacs**
  - **2 Studies in BTK**
  - **7 studies in Fem-Pop**
  - **Remaining studies included a mixture**
- **Rutherford Classification:**
  - **1 study: 1-3**
  - **2 studies: 4-6**
  - **Remaining studies had a mixture**
- **Mixture of definitive treatment modalities: PTA, Primary stenting, Atherectomy etc..**

Conclusion

- IVUS-PTA was associated with:
  - Significantly better F-MA at 12 months (?CLTI)
  - Significantly better technical success
  - Significantly Higher rate of Bail-out stenting
- AO-PTA was associated with:
  - Significantly better F-TLR at 12 months
- Adequately powered RCTs with:
  - Defined patient groups (e.g. CLTI only)
  - Clear clinically-relevant outcome measures
  - Defined definitive treatment strategies and sub-group analysis